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Does risk perception really exist?

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ABSTRACT

The main aims of the current study were to examine the risk perception concept and the role of risk perception and worry in demands for risk mitigation in urban transport. The results are based on a self-completion questionnaire survey carried out in representative samples of six Norwegian urban areas ($n = 1047$). Risk perception, worry and demand for risk mitigation were found to differ according to the type of travel mode in question. The results did not support the idea that risk perception could be conceptualised as a reflective construct of accident probability assessment and judgement of the severity of the consequences. Factors previously assumed to be important in the conceptualisation of risk perception may not be a fruitful basis for understanding how the urban public perceives risks in transport. It is not primarily the risk, but the risk source that is perceived. Risk perception is less conceptual than object-centred, and measures aimed at influencing perceptions of travel mode risk should to a larger extent take into consideration how such risk is perceived.

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1. Introduction

1.1. How to examine risk perception

Two theories have dominated the risk perception research. The first one is the psychometric paradigm. The other theory is the cultural theory, developed by Douglas (1982) and Douglas and Wildavsky (1982), who have shown that perception of risk has its origins in cultural factors. The initial studies conducted by Wildavsky and Dake (1990) gave support to the theory. However, the majority of studies carried out afterwards applying their measurement instrument have failed to confirm these findings (Marris et al., 1998; Sjöberg, 1997; Palmer, 1996; Peters and Slovic, 1996; Oltedal and Rundmo, 2007). Due to lack of empirical support the research aimed at explaining perceived risk by cultural adherence has also decreased during the last years. Consequently, the current study does not aim further to examine this perspective.

The psychometric approach has dominated the research in the area of risk perception during the last decades. It focuses on the unique and subjective qualities of risk perception (Slovic, 1992, 2000). The basic assumption in this approach is that perceived risk is multidimensional and can be measured by scales reflecting the unique characteristics of the risk source. Factor analysis has also shown that risk sources have a unique pattern of qualities and that these qualities are related to perceived risk (Fischhoff et al., 1978). A total of nine general properties of the risk source were found to be important in risk perception. The nine properties were voluntariness of risk, immediacy of effect, knowledge about the risk by the person who are exposed to the potentially-hazardous risk source, knowledge about the risk in science, control over the risk, newness (i.e. are the risks new and novel or old and familiar), chronic/catastrophic (i.e. a risk that may kill people one at a time or a risk that can kill a large number of people at once), common/dread (i.e. whether people have learned to live with and can think about the risk reasonably and calmly, or is it a risk that people have great dread for, on the level of a gut reaction) and severity of consequences. The paradigm hypothesised that the degree to which these factors are related to potentially hazardous activities or technologies determines people's risk perception (Fischhoff et al., 2000).

Of the nine properties factor analysis based on aggregated data showed that dread and novelty were the most important dimensions. Risk perception was understood to be a formative construct where the nine risk source characteristics, where dread and novelty are the most important, constitute the 'underlying' or abstract concept, i.e. risk perception. Consequently, the judgements of the risk sources were assumed to reflect perceived risk. For the concept of risk perception to be meaningful we could therefore expect the main characteristics of perceived risk to be associated in order to reflect the construct, i.e. perceived risk is reflected in the level of perceived risk measured in these characteristics. If so, the psychometric paradigm conceives risk perception in accordance with a reflective measurement model in line with other constructs with

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properties suitable for factor analysis. If perceived risk is not considered as a reflective construct, risk perception is identical to object perception and, hence, is not meaningful as a distinct construct.

In addition to the characteristics of the risk source that are indicators of perceived risk, other factors may be important for perceived level of risk, which has been found to depend on several variables, such as gender, age and education. Numerous studies concerning health risks as well as risk in traffic and environmental risks, have found that women assess higher risk than men (Boholm, 1998; Byrnes et al., 1999; Davidson and Freudenburg, 1996; DeJoy, 1992; Flynn et al., 1994; Glendon et al., 1996). According to Gustafson (1998) men and women probably do not concern themselves with the same type of risk and the notion of gender-specific risks implies that men and women do not only perceive the same risks somewhat differently, but also perceive different risk. What appear to be the same risks may have different meanings for women and men.

As with gender, age differences in risk perception have also been established. Young people assess dangers to be lower than older people and the former also take more risk (Glendon et al., 1996; Jonah and Dawson, 1987; Matthews and Moran, 1986; Rutter and Quine, 1996; Sicard et al., 2001). According to Deery (1999), it is well established that e.g. young novice drivers have a disproportionately large role in vehicle crashes in transport. A proposed reason for this is that they overestimate their skills. Others have found that adolescents are more optimistic about the positive outcome of an action than their older counterparts (McKenna, 1993).

The higher the level of education, the less is the risk often judged to be. Kraus et al. (2000) investigated differences in college educated and non-college educated respondents. In general, respondents with a college degree had more favourable attitudes towards chemicals, greater appreciation of the medicating role of dose and exposure, and less concern about risks. In their study, the college-educated respondents appeared to be somewhat more similar to the experts than the non-college educated respondents were. Moen and Rundmo (2005) on the other hand, found education to be related to less optimism about experiencing an injury and thereby concluded that probability assessments differed with education and that more experienced subjects rated the probability of experiencing an injury to be higher.

These studies differed in how they measured risk. Kraus et al. (2000) asked subjects to evaluate different characteristics of the risk, whereas Moen and Rundmo (2005) asked the subjects to assess the probability that they would experience injury following risk sources related to a specific hobby (skydiving) or their occupation (fire fighters and employees in the army). Thereby, an investigation of the difference in risk perception due to a difference in the assessment of general vs. personal risk is needed.

Several studies have also shown that safety experts judge risk differently compared to lay people (see e.g. Gardner and Gould, 1989; Rundmo and Moen, 2006). Experts stressed the probability component when asked about their risk judgement, and lay people tended to stress the consequences. In transport familiarity with the risk sources can also influence the judgement of these sources. Therefore, it could be hypothesised that the frequency of use of travel modes is positively associated with perceived risk (Rundmo et al., 2011).

Studies have also found differences in perceived risk due to race. Flynn et al. (1994) found that white men judged risk to be less compared to white women. This difference was not found between non-white men and non-white women. Risk tends to be perceived as lower by white people compared to Afro Americans. This was supported by Davidson and Freudenburg (1996) who found that with gender and race taken together, the white men were found to be less concerned about the investigated risks than all other respondents.

In the current study neither level of safety expertise nor race is taken into consideration. This was because the study was carried out in a sample of lay people and in a rather homogenous white population. However, because several previous studies have shown that the differences in risk perception due to gender, age group, and educational level are significant predictor variables of perceived level of risk, these variables should be included as covariates when analysing perceived level of risk.

1.2. Perceived risk as a predictor variable of demand for risk mitigation

In the above-cited studies perceived risk was used as the criterion variable. Another focus in risk perception research has been to study risk perception as a predictor variable of demand for risk mitigation. Demand for risk mitigation is the demand from the public towards the authorities or government to reduce a specific risk source. It could be hypothesised that when the level of risk is 'too high' this will also influence the demand for risk mitigation. In addition to how a risk source is perceived, worry and risk sensitivity (i.e. a tendency to perceive all risks as high or low) may be associated with demands for risk mitigation.

The psychometric paradigm is primarily a cognitive theory, but it has been argued that affect is very important in risk perception, seemingly supporting the traditional view that dread is a dominating factor in perceived risk (Fischhoff et al., 1978). Consequently, there is more to demand for risk reduction than the pure cognitive evaluation of the risk. The concept of risk perception should accordingly be distinguished from the broader risk judgement concept. Risk judgement includes perceived risk as well as worry. Thus, in the current study risk perception is understood to be a pure cognitive construct including the subjective assessment of probability and judgement of severity of consequence if a negative event should take place, i.e. an individual's intuitive judgement of probability of occurrence and the severity of the associated consequences (Hudspith, 2004). When dread and emotion are included into the intuitive assessments it represents risk judgements and not risk perception. To define risk perception as a cognitive construct also makes it possible to compare perceived risk and objective risk. Contrary to perceived risk, objective or real risk estimates are based on formative indicators, i.e. indicators that are not necessarily associated with each other. It concerns use of some measurement instrument to calculate the level of risk (probability $\times$ severity of consequences $\times$ level of exposure). An advantage of defining perceived risk without including emotions is that it makes possible a comparison of intuitive assessments and objective estimates of risk.

Rundmo and Moen (2006) showed that judgement of severity of consequences was associated with anticipated worry. Anticipated worry was the most significant predictor variable of demand for risk mitigation. Accordingly, the current study distinguishes between risk perception and anticipated worry, i.e. how concerned the respondents felt 'when thinking about' the risk of an accident. In this conceptualisation of perceived risk, emotional or affective reactions are not included. This also makes it possible to examine the associations between risk perception and worry.

The risk-as-feelings approach (Loewenstein et al., 2001) concerns the role of cognitive evaluations as well as feelings, e.g. worry, in risk decisions. In the consequentialist approach as well as in the risk-as-feeling approach subjective assessments of probability are defined as a predictor variable of the cognitive evaluations. In the risk-as-feeling approach it is hypothesised that the cognitive evaluation of a risk source is formed by anticipated emotions, e.g. worry, and subjective assessments of probability.

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